

We claim:

1. A method of preparing a polymerizate comprising the step of polymerizing a two-component composition comprised of:

- 5 (a) a first component containing at least one polycyanate reactant having at least two functional groups selected from isocyanate, isothiocyanate and combinations thereof, the polycyanate reactant being the reaction product of,
- (i) a polythiol monomer having at least two thiol groups; and
- (ii) a polycyanate monomer having at least two functional
- 10 groups selected from isocyanate, isothiocyanate and combinations thereof; and
- (b) a second component containing at least one polyamine reactant having at least two functional groups selected from primary amine, secondary amine and combinations thereof; wherein the molar equivalent ratio of (NCO + NCS) groups from said first component to (-NH<sub>2</sub> + -NH-) groups from said second component is
- 15 from 0.5 to 100.

2. The method of claim 1 wherein said first component further comprises
- (iii) a reactive hydrogen material having at least two reactive hydrogen groups, the reactive hydrogen material being selected from the group consisting of polyols and
- 20 materials having both hydroxyl and thiol groups; and mixtures thereof.

3. The method of claim 1 wherein the relative amounts of (i) and (ii) in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH) is greater than 1.0.
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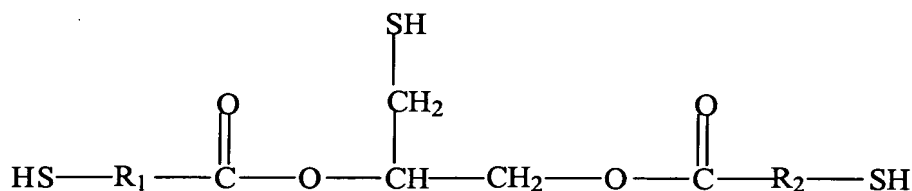
4. The method of claim 2 wherein the relative amounts of (i), (ii) and (iii) being in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is greater than 1.0.

- 30 5. The method of claim 1 wherein said first component and said second component are selected such that when they are polymerized, the resulting

polymerizate has a refractive index of at least about 1.57, an Abbe number of at least about 30 and an initial Barcol hardness of at least 1.

6. The method of claim 2 wherein the relative amounts of (i), (ii) and (iii) are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is from 1.2:1.0 to 4.0:1.0.

7. The method of claim 1 wherein said polythiol monomer is selected from the group consisting of 2,5-dimercaptomethyl-1,4-dithiane, 2,2'-thiodiethanethiol, pentaerythritol tetrakis(3-mercaptopropionate), pentaerythritol tetrakis(2-mercaptoacetate), trimethylolpropane tris(3-mercaptopropionate), trimethylolpropane tris(2-mercaptoacetate), 4-mercaptomethyl-3,6-dithia-1,8-octanedithiol, 4-tert-butyl-1,2-benzenedithiol, 4,4'-thiodibenzenethiol, benzenedithiol, ethylene glycol di(2-mercaptoacetate), ethylene glycol di(3-mercaptopropionate), poly(ethylene glycol) di(2-mercaptoacetate) and poly(ethylene glycol) di(3-mercaptopropionate), a polythiol represented by the general formula:

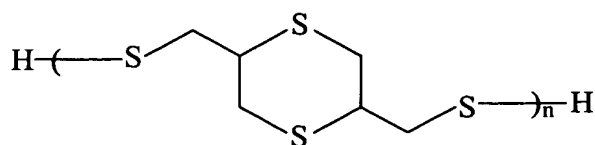


- wherein R<sub>1</sub> and R<sub>2</sub> are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and C<sub>1</sub>-C<sub>9</sub> alkyl substituted phenylene, and oligomers of said polythiols; and mixtures of said polythiol monomers.

8. The method of claim 7, wherein said polythiol oligomer has disulfide linkages and is prepared by reacting a polythiol monomer, with sulfur, in the presence of a basic catalyst.

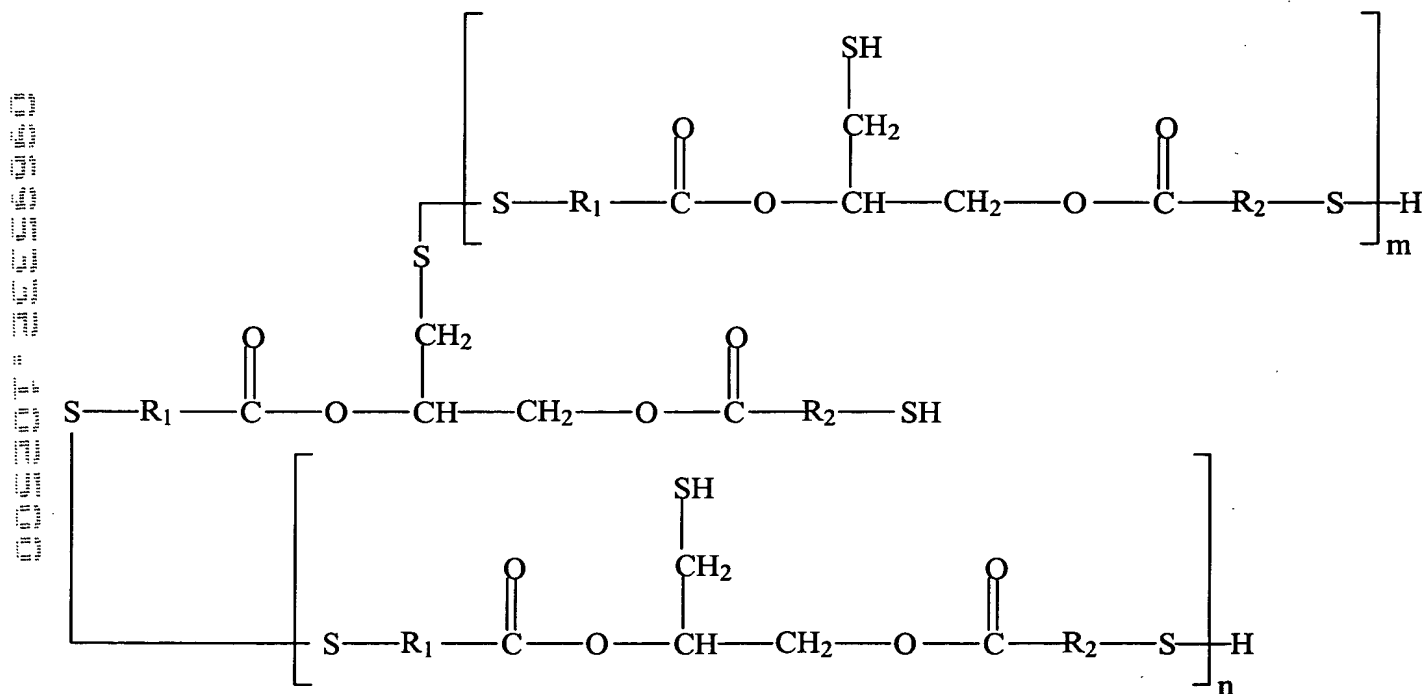
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9. The method of claim 7 wherein said polythiol oligomer is represented by the general formula:



wherein n is an integer from 1 to 21.

10. The method of claim 7 wherein said polythiol oligomer is represented by the general formula:

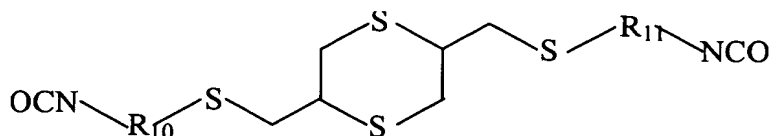


5 wherein R<sub>1</sub> and R<sub>2</sub> are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and C<sub>1</sub>-C<sub>9</sub> alkyl substituted phenylene and n and m are independently integers from 0 to 21 such that n + m is at least 1.

11. The method of claim 1 wherein said polycyanate monomer is a  
10 polycyanate having at least two isocyanate groups.

12. The method of claim 1 wherein said polycyanate monomer is a polycyanate having one or more sulfur atoms in its backbone.

13. The method of claim 12 wherein the polycyanate monomer having one or more sulfur atoms in its backbone is one having the general structure:



wherein  $R_{10}$  and  $R_{11}$  are each independently  $C_1$  to  $C_3$  alkyl.

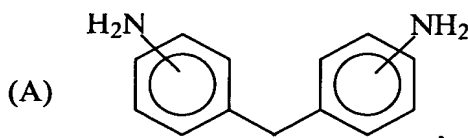
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14. The method of claim 11 wherein said polycyanate monomer is selected from the group consisting of  $\alpha, \alpha'$ -xylene diisocyanate,  $\alpha, \alpha, \alpha', \alpha'$ -tetramethylxylene diisocyanate, isophorone diisocyanate, bis(isocyanatocyclohexyl)methane, ortho-toluidine diisocyanate, ortho-tolylidine diisocyanate, ortho-tolylene diisocyanate and 4,4'-diphenylmethane diisocyanate, and mixtures of said polycyanate monomers.

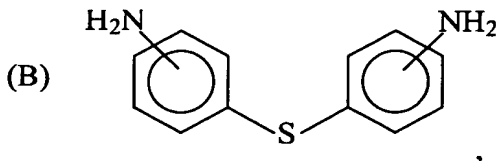
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15. The method of claim 1 wherein said polyamine reactant of said second component is selected from the group consisting of ethyleneamines,  $C_1$ - $C_3$  dialkyl toluenediamine, methylene dianiline, trimethyleneglycol di(para-aminobenzoate), a diamine represented by the general formula (A):

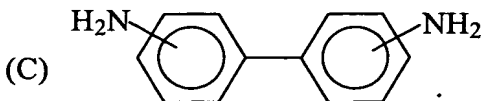
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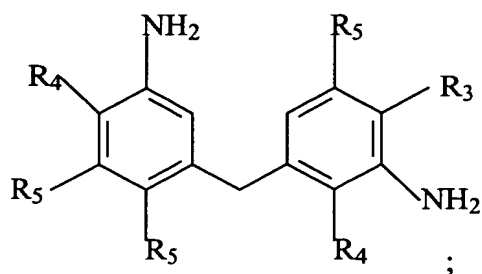
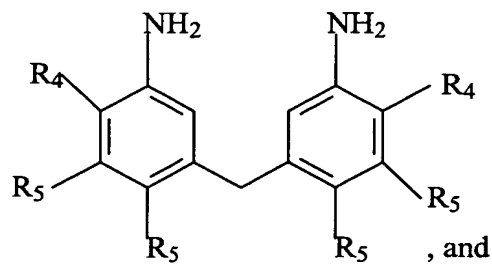
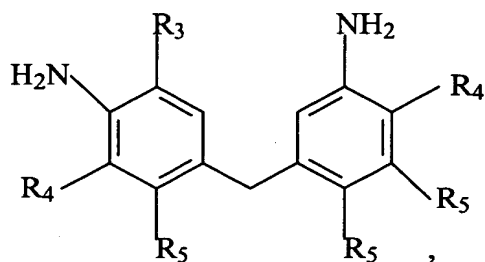
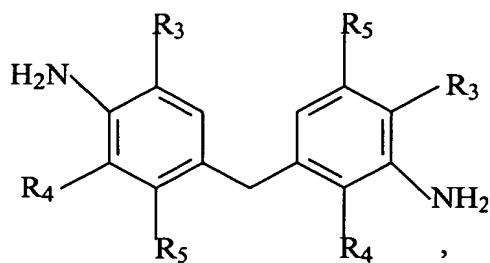
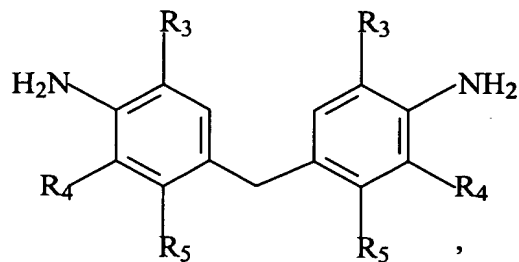
a diamine represented by the general formula (B):



and a diamine represented by the general formula (C):

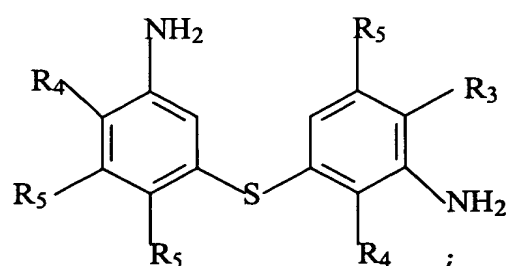
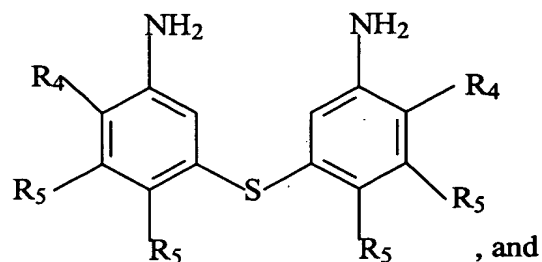
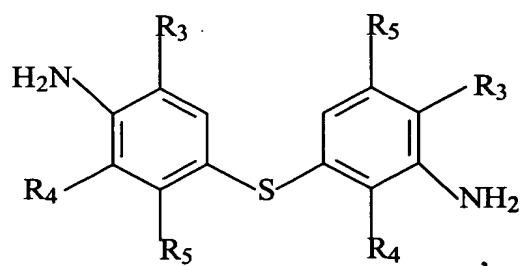
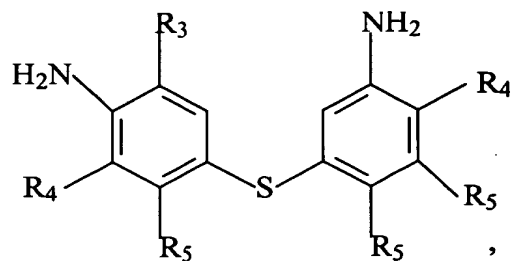
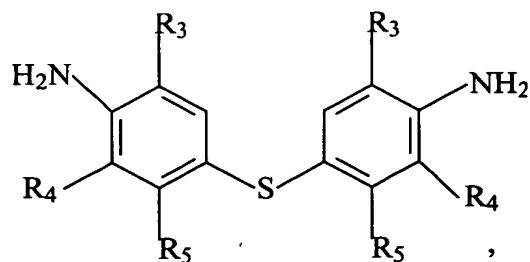


16. The method of claim 15 wherein the diamine of general formula (A) is selected from one or more of the group consisting of:



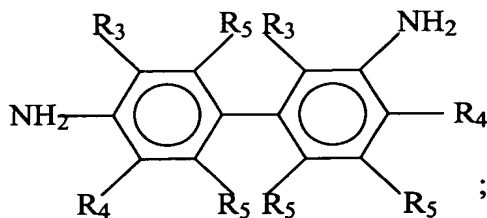
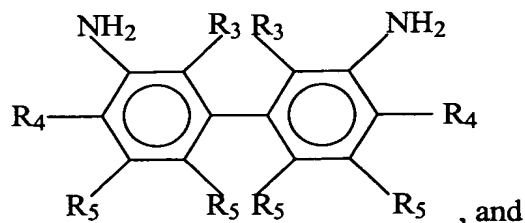
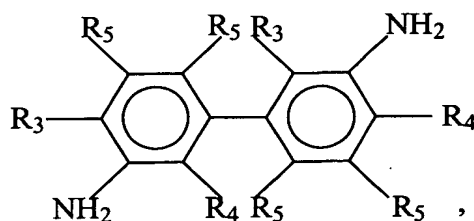
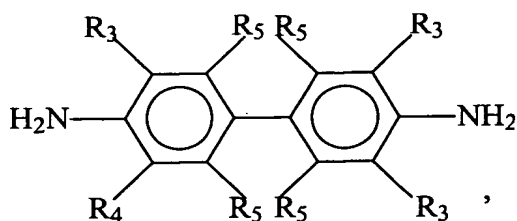
wherein  $R_3$  and  $R_4$  are each independently  $C_1$ - $C_3$  alkyl, and  $R_5$  is selected from hydrogen and halogen, and mixtures of said diamines.

17. The method of claim 15 wherein the diamine of general formula (B) is  
5 selected from one or more of the group consisting of:



wherein  $R_3$  and  $R_4$  are each independently  $C_1$ - $C_3$  alkyl, and  $R_5$  is selected from hydrogen and halogen, and mixtures of said diamines.

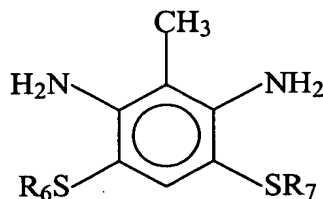
18. The method of claim 15 wherein the diamine of general formula (C) is  
5 selected from one or more of the group consisting of:



- wherein  $R_3$  and  $R_4$  are each independently  $C_1$ - $C_3$  alkyl, and  $R_5$  is selected from  
10 hydrogen and halogen, and mixtures of said diamines.

19. The method of claim 1 wherein said polyamine reactant of said second component is a diamino toluene dialkyl sulfide.

20. The method of claim 19 wherein said diamino toluene dialkyl sulfide is a  
5 2,6 diaminotoluene-3,5-dialkyl sulfide of the general formula:



wherein  $R_6$  and  $R_7$  are linear, branched or cyclic  $C_1$  to  $C_{20}$  alkyl.

21. The method of claim 1 further comprising the step of adding a catalyst to  
10 said two-component composition.

22. The method of claim 21 wherein said catalyst is selected from the group consisting of tertiary amines and organometallic compounds.

15 23. The method of claim 1 further comprising the step of :  
mixing said first component and said second component.

24. The method of claim 1 further comprising the step of :  
degassing said first component.

20 25. The method of claim 1 further comprising the step of :  
degassing said second component.

26. The method of claim 23 further comprising the step of :  
25 adding the mixture to a mold.

27. The method of claim 26 further comprising the step of :



heating the mold and the mixture of said first component and said second component within it.

28. The method of claim 27 wherein said heating step further includes heating  
5 the mold and said mixture to a temperature of from 100°C to 140°C over a period of from 0.5 to 16 hours.

29. The method of claim 1 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar  
10 equivalent ratio of (NCO + NCS) groups to (-NH<sub>2</sub> + -NH-) groups of from 0.5 to 10.

30. The method of claim 1 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH<sub>2</sub> + -NH-) groups of from 0.5 to 5.  
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31. The method of claim 1 further comprising the step of adding additives selected from the group consisting of light stabilizers, heat stabilizers, antioxidants, ultraviolet light absorbers, mold release agents, static (non-photochromic) dyes, pigments and flexibilizing additives and anti-yellowing additives; and mixtures of  
20 said additives.

32. The method of claim 31 wherein the additives are present in said two component composition, in an amount up to 10% by weight of said two component composition.  
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33. The method of claim 31 wherein the mold release agent is a C<sub>8</sub> to C<sub>16</sub> alkyl phosphate ester.

34. The method of claim 1 wherein said polymerizate further comprises a  
30 photochromic substance.

35. A polymerizate prepared by polymerizing a two-component composition comprised of:

- (a) a first component containing at least one polycyanate reactant having at least two functional groups selected from isocyanate, isothiocyanate and combinations thereof, the polycyanate reactant being the reaction product of,
- 5 (i) a polythiol monomer having at least two thiol groups; and  
(ii) a polycyanate monomer having at least two functional groups selected from isocyanate, isothiocyanate and combinations thereof; and
- (b) a second component containing at least one polyamine reactant
- 10 having at least two functional groups selected from primary amine, secondary amine and combinations thereof; wherein the molar equivalent ratio of (NCO + NCS) groups from said first component to (-NH<sub>2</sub> + -NH-) groups from said second component is from 0.5 to 100.

15 36. The polymerizate of claim 35 wherein said first component further comprises (iii) a reactive hydrogen material having at least two reactive hydrogen groups, the reactive hydrogen material being selected from the group consisting of polyols and materials having both hydroxyl and thiol groups, and mixtures thereof.

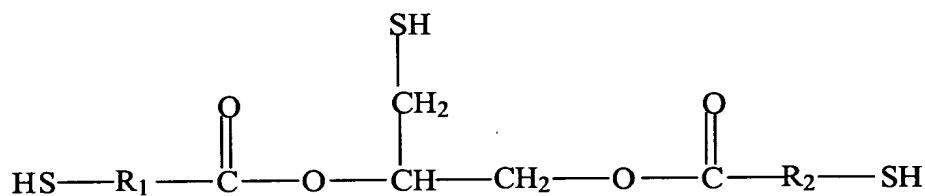
20 37. The polymerizate of claim 35 wherein the relative amounts of (i) and (ii) in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH) is greater than 1.0.

25 38. The polymerizate of claim 36 wherein the relative amounts of (i), (ii) and (iii) being in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is greater than 1.0.

30 39. The polymerizate of claim 35 wherein said first component and said second component are selected such that when they are polymerized, the resulting polymerizate has a refractive index of at least about 1.57, an Abbe number of at least about 30 and an initial Barcol hardness of at least 1.

40. The polymerizate of claim 38 wherein the relative amounts of (i), (ii) and (iii) are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is from 1.2:1.0 to 4.0:1.0.

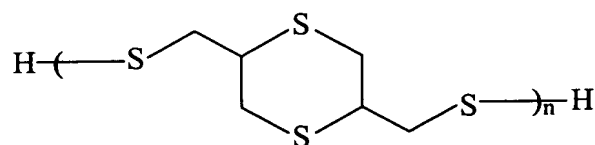
- 5            41. The polymerizate of claim 35 wherein said polythiol monomer is selected from the group consisting of 2,5-dimercaptomethyl-1,4-dithiane, 2,2'-thiodiethanethiol, pentaerythritol tetrakis(3-mercaptopropionate), pentaerythritol tetrakis(2-mercaptoacetate), trimethylolpropane tris(3-mercaptopropionate), trimethylolpropane tris(2-mercaptoacetate), 4-mercaptopomethyl-3,6-dithia-1,8-  
10 octanedithiol, 4-tert-butyl-1,2-benzenedithiol, 4,4'-thiodibenzenethiol, benzenedithiol, ethylene glycol di(2-mercaptoacetate), ethylene glycol di(3-mercaptopropionate), poly(ethylene glycol) di(2-mercaptoacetate) and poly(ethylene glycol) di(3-mercaptopropionate) and a polythiol represented by the general formula:



- 15        wherein  $\text{R}_1$  and  $\text{R}_2$  are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and  $\text{C}_1$ - $\text{C}_9$  alkyl substituted phenylene, and oligomers of said polythiols;, and mixtures of said polythiol monomers.

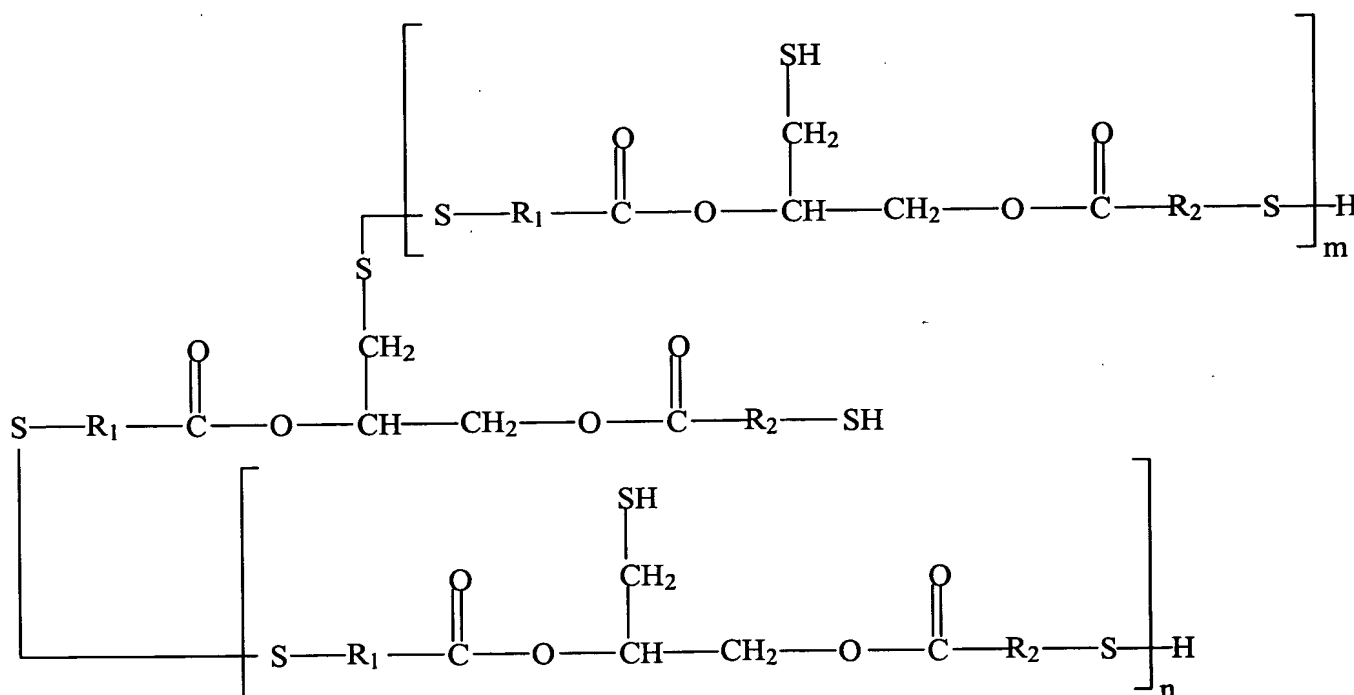
- 20        42. The polymerizate of claim 41 wherein said polythiol oligomer has disulfide linkages and is prepared by reacting a polythiol monomer with sulfur in the presence of a basic catalyst.

43. The polymerizate of claim 41 wherein said polythiol oligomer is represented by the general formula:



wherein n is an integer from 1 to 21.

44. The polymerizate of claim 41 wherein said polythiol oligomer is represented by the general formula:



5 wherein R<sub>1</sub> and R<sub>2</sub> are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and C<sub>1</sub>-C<sub>9</sub> alkyl substituted phenylene and n and m are independently integers from 0 to 21 such that n + m is at least 1.

45. The polymerizate of claim 35 wherein said polycyanate monomer is a  
10 polycyanate having at least two isocyanate groups.

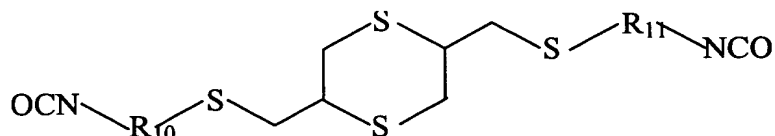
46. The polymerizate of claim 45 wherein said polycyanate monomer is selected from the group consisting of α,α'-xylene diisocyanate, α,α',α',α'-

tetramethylxylene diisocyanate, isophorone diisocyanate, bis(isocyanatocyclohexyl)methane, ortho-toluidine diisocyanate, ortho-tolylidine diisocyanate, ortho-tolylene diisocyanate and 4,4'-diphenylmethane diisocyanate, , and mixtures of said polycyanate monomers.

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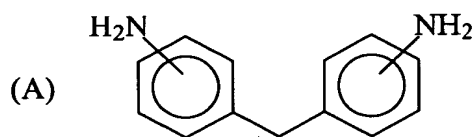
47. The polymerizate of claim 45 wherein said polycyanate monomer contains one or more sulfur atoms in its backbone.

48. The photochromic article of claim 47 wherein the polycyanate monomer  
10 containing one or more sulfur atoms in its backbone has the general structure:

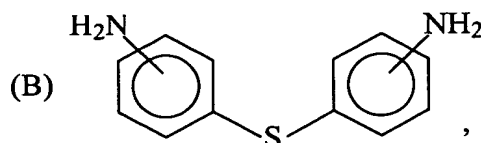


wherein  $R_{10}$  and  $R_{11}$  are each independently  $C_1$  to  $C_3$  alkyl.

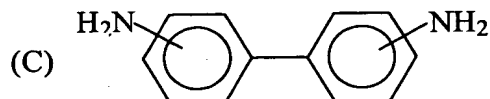
49. The polymerizate of claim 35 wherein said polyamine reactant of said  
15 second component is selected from the group consisting of ethyleneamines,  $C_1$ - $C_3$  dialkyl toluenediamine, methylene dianiline, trimethyleneglycol di(para-aminobenzoate), a diamine represented by the general formula (A):



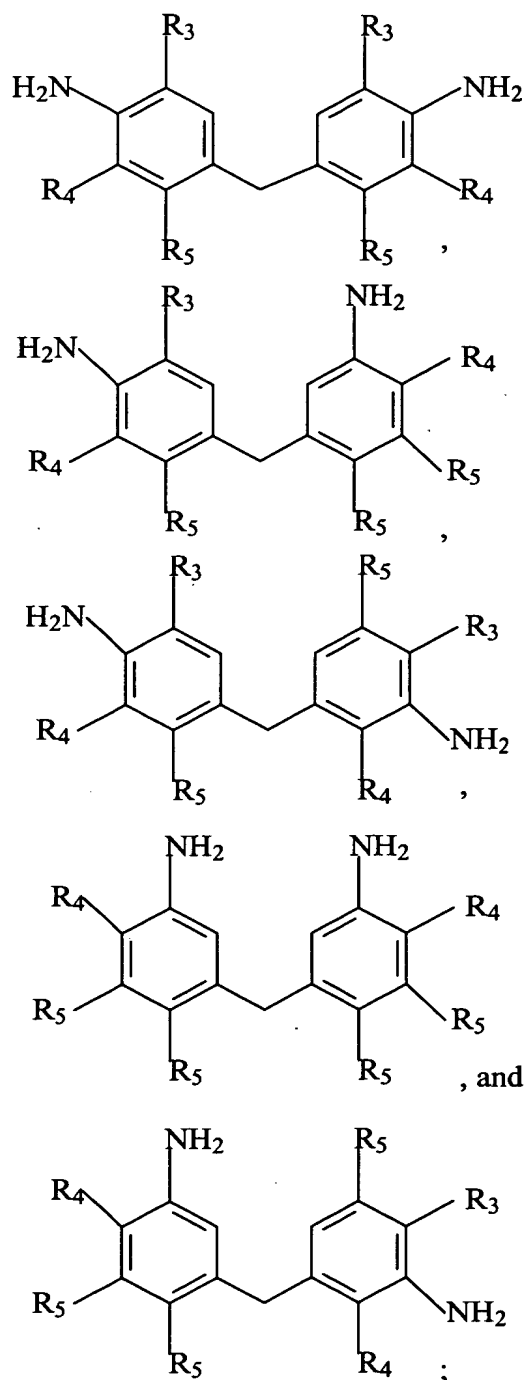
a diamine represented by the general formula (B):



and a diamine represented by the general formula (C):

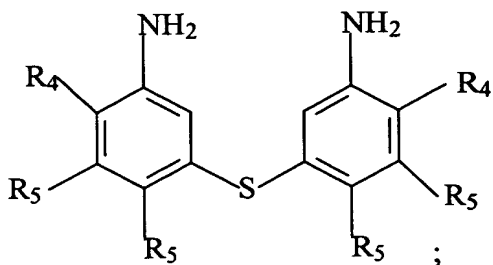
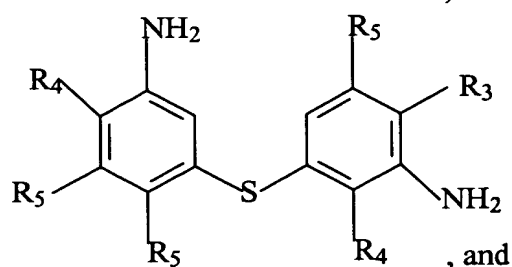
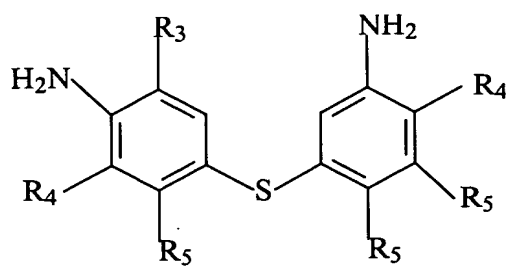
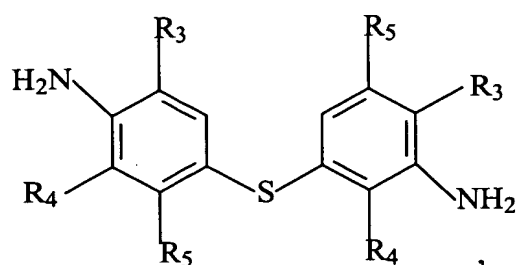
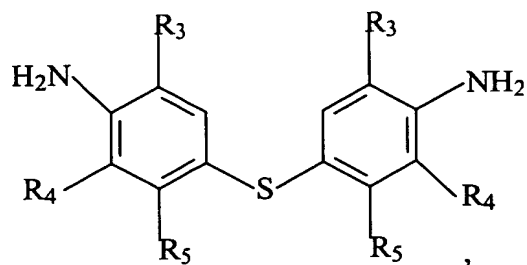


50. The polymerizate of claim 49 wherein the diamine of general formula (A) is selected from one or more of the group consisting .



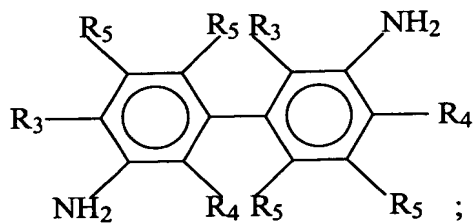
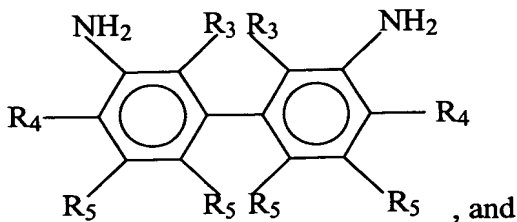
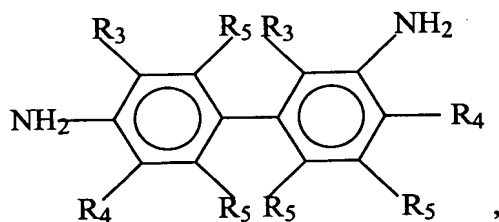
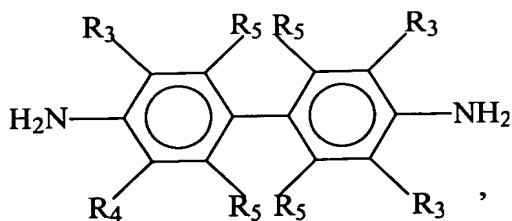
wherein R<sub>3</sub> and R<sub>4</sub> are each independently C<sub>1</sub>-C<sub>3</sub> alkyl, and R<sub>5</sub> is selected from  
5 hydrogen and halogen, and mixtures of said diamines.

51. The polymerizate of claim 49 wherein the diamine of general formula (B) is selected from one or more of the group consisting of:



wherein  $R_3$  and  $R_4$  are each independently  $C_1$ - $C_3$  alkyl, and  $R_5$  is selected from hydrogen and halogen, and mixtures of said diamines.

52. The polymerizate of claim 49 wherein the diamine of general formula (C) is selected from one or more of the group consisting of:

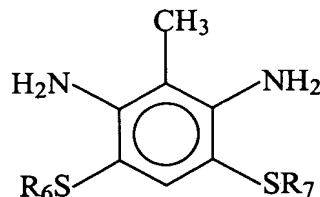


- 10 wherein  $R_3$  and  $R_4$  are each independently  $C_1$ - $C_3$  alkyl, and  $R_5$  is selected from hydrogen and halogen, and mixtures of said diamines.

53. The polymerizate of claim 35 wherein said polyamine reactant of said second component is a diamino toluene dialkyl sulfide.



54. The polymerizate of claim 53 wherein said diamino toluene dialkyl sulfide is a 2,6 diaminotoluene-3,5-dialkyl sulfide of the general formula:



wherein  $R_6$  and  $R_7$  are linear, branched or cyclic  $C_1$  to  $C_{20}$  alkyl

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55. The polymerizate of claim 35 wherein a catalyst is added to said two-component composition to promote the polymerization.

56. The polymerizate of claim 55 wherein said catalyst is selected from the group consisting of tertiary amines and organometallic compounds.

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57. The polymerizate of claim 35 wherein the polymerization process further comprises the step of :

mixing said first component and said second component.

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58. The polymerizate of claim 35 wherein the polymerization further comprises the step of :

degassing said first component.

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59. The polymerizate of claim 35 wherein the polymerization further comprises the step of :

degassing said second component.

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60. The polymerizate of claim 57 wherein the polymerization further comprising the step of:

adding the mixture to a mold.

61. The polymerizate of claim 60 wherein the polymerization further comprising the step of:

heating the mold and the mixture of said first component and said second component within it.

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62. The polymerizate of claim 61 wherein said heating step further includes heating the mold and said mixture to a temperature of from 100°C to 140° over a period of from 0.5 to 16 hours.

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63. The polymerizate of claim 35 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH<sub>2</sub> + -NH-) groups of from 0.5 to 10.

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64. The polymerizate method of claim 35 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH<sub>2</sub> + -NH-) groups of from 0.5 to 5.

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65. The polymerizate of claim 35 further comprising additives selected from the group consisting of light stabilizers, heat stabilizers, antioxidants, ultraviolet light absorbers, mold release agents, static (non-photochromic) dyes, pigments and flexibilizing additives and anti-yellowing additives; and mixtures of said additives.

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66. The polymerizate of claim 65 wherein the mold release agent is a C<sub>8</sub> to C<sub>16</sub> alkyl phosphate ester.

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67. The polymerizate of claim 65 wherein the additives are present in said polymerizate in an amount up to 10% by weight of said polymerizate.

68. The polymerizate of claim 35 further comprising a photochromic substance.

69. A photochromic article derived from a polymerizate prepared by polymerizing a two-component composition comprised of:

- (a) a first component containing at least one polycyanate reactant having at least two functional groups selected from isocyanate, isothiocyanate and combinations thereof, the polycyanate reactant being the reaction product of,
- 5 (i) a polythiol monomer having at least two thiol groups; and  
(ii) a polycyanate monomer having at least two functional groups selected from isocyanate, isothiocyanate and combinations thereof; and
- (b) a second component containing at least one polyamine reactant
- 10 having at least two functional groups selected from primary amine, secondary amine and combinations thereof; wherein the molar equivalent ratio of (NCO + NCS) groups from said first component to (-NH<sub>2</sub> + -NH-) groups from said second component is from 0.5 to 100.

15 70. The photochromic article of claim 69 wherein said first component further comprises (iii) a reactive hydrogen material having at least two reactive hydrogen groups, the reactive hydrogen material being selected from the group consisting of polyols and materials having both hydroxyl and thiol groups, and mixtures thereof.

20 71. The photochromic article of claim 69 wherein the relative amounts of (i) and (ii) in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH) is greater than 1.0.

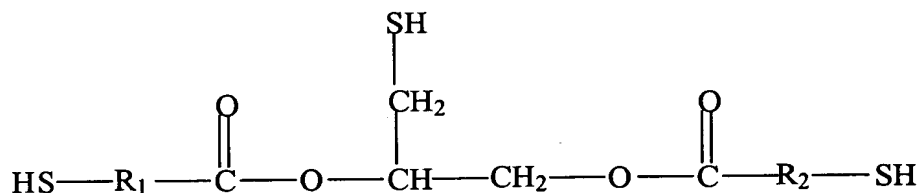
25 72. The photochromic article of claim 70 wherein the relative amounts of (i), (ii) and (iii) being in said first component are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is greater than 1.0.

73. The photochromic article of claim 69 wherein said first component and said second component are selected such that when they are polymerized, the

30 resulting polymerizate has a refractive index of at least about 1.57, an Abbe number of at least about 30 and an initial Barcol hardness of at least 1.

74. The photochromic article of claim 70 wherein the relative amounts of (i), (ii) and (iii) are selected such that the molar equivalents ratio of (NCO + NCS)/(SH + OH) is from 1.2:1.0 to 4.0:1.0.

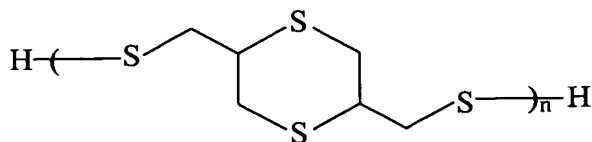
- 5            75. The photochromic article of claim 69 wherein said polythiol monomer is selected from the group consisting of 2,5-dimercaptomethyl-1,4-dithiane, 2,2'-thiodiethanethiol, pentaerythritol tetrakis(3-mercaptopropionate), pentaerythritol tetrakis(2-mercaptoacetate), trimethylolpropane tris(3-mercaptopropionate), trimethylolpropane tris(2-mercaptoacetate), 4-mercaptomethyl-3,6-dithia-1,8-  
10 octanedithiol, 4-tert-butyl-1,2-benzenedithiol, 4,4'-thiodibenzenethiol, benzenedithiol, ethylene glycol di(2-mercaptoacetate), ethylene glycol di(3-mercaptopropionate), poly(ethylene glycol) di(2-mercaptoacetate) and poly(ethylene glycol) di(3-mercaptopropionate), a polythiol represented by the general formula:



- 15        wherein R<sub>1</sub> and R<sub>2</sub> are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and C<sub>1</sub>-C<sub>9</sub> alkyl substituted phenylene, and oligomers of said polythiols; and mixtures of said polythiol monomers.

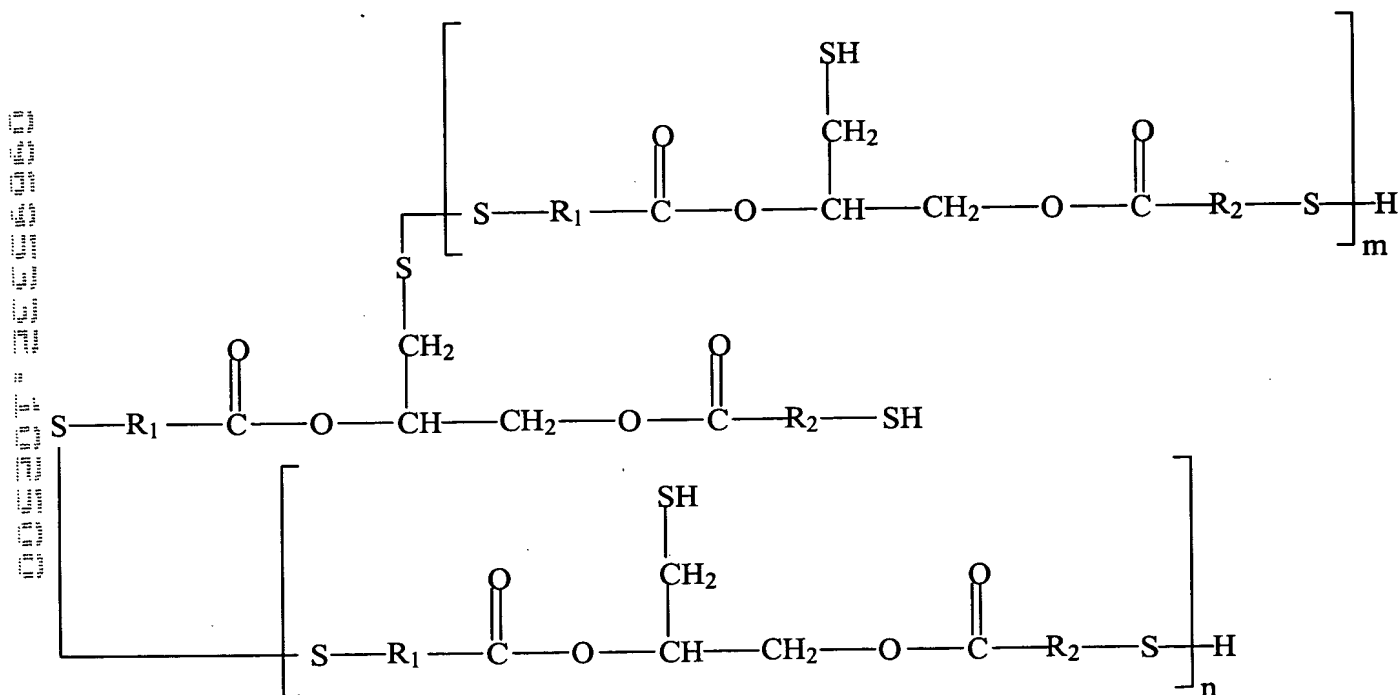
- 20        76. The photochromic article of claim 75 wherein said polythiol oligomer has disulfide linkages and is prepared by reacting a polythiol monomer with sulfur in the presence of a basic catalyst.

77. The photochromic article of claim 75 wherein said polythiol oligomer is represented by the general formula:



wherein n is an integer from 1 to 21.

78. The photochromic article of claim 75 wherein said polythiol oligomer is represented by the general formula:



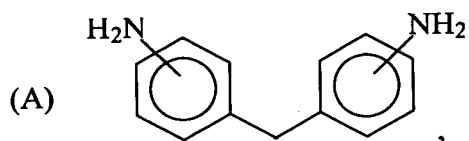
5 wherein R<sub>1</sub> and R<sub>2</sub> are each independently selected from straight or branched chain alkylene, cyclic alkylene, phenylene and C<sub>1</sub>-C<sub>9</sub> alkyl substituted phenylene and n and m are independently integers from 0 to 21 such that n + m is at least 1.

79. The photochromic article of claim 69 wherein said polycyanate monomer  
10 is a polycyanate having at least two isocyanate groups.

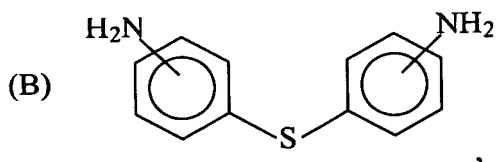
80. The photochromic article of claim 79 wherein said polycyanate monomer is selected from the group consisting of α,α'-xylene diisocyanate, α,α,α',α'-tetramethylxylene diisocyanate, isophorone diisocyanate,

bis(isocyanatocyclohexyl)methane, ortho-toluidine diisocyanate, ortho-tolyldine diisocyanate, ortho-tylene diisocyanate and 4,4'-diphenylmethane diisocyanate, , and mixtures of said polycyanate monomers.

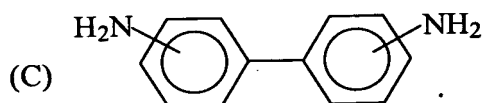
- 5            81. The photochromic article of claim 69 wherein said polyamine reactant of said second component is selected from the group consisting of ethyleneamines, C<sub>1</sub>-C<sub>3</sub> dialkyl toluediamine, methylene dianiline, trimethyleneglycol di(para-aminobenzoate), a diamine represented by the general formula (A):



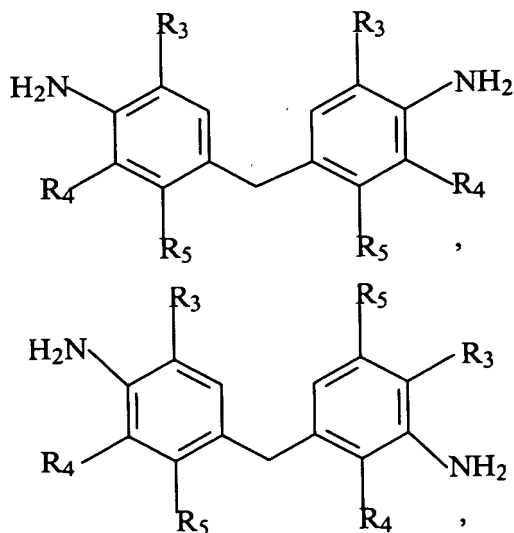
a diamine represented by the general formula (B):

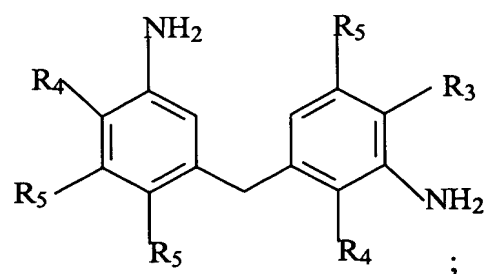
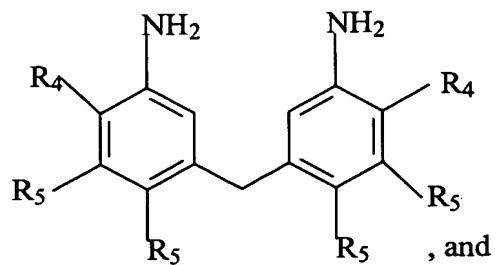
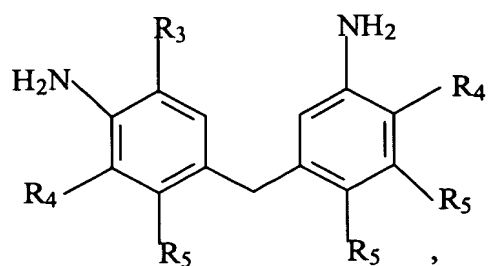


- 10          and a diamine represented by the general formula (C):



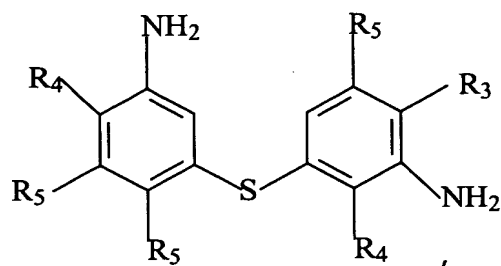
82. The method of claim 81 wherein the diamine of general formula (A) is selected from one or more of the group consisting of:

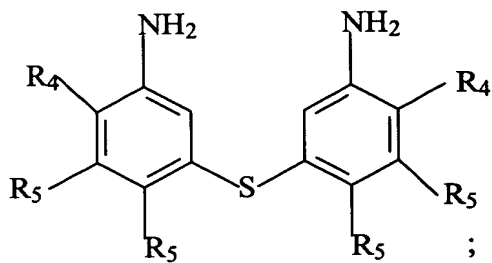
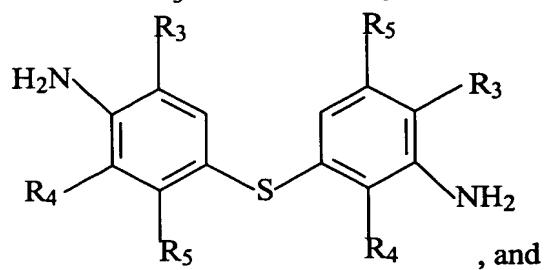
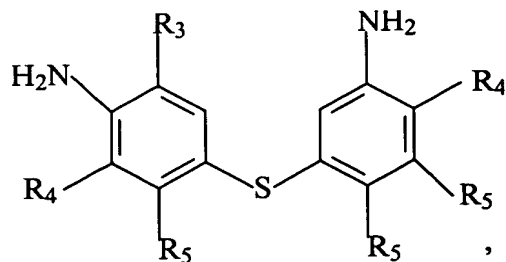
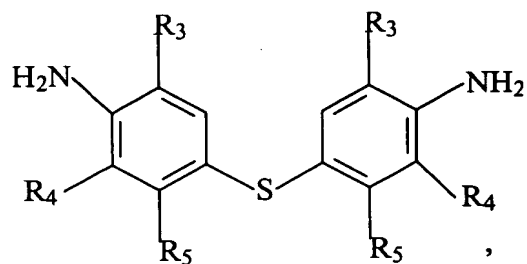




wherein  $R_3$  and  $R_4$  are each independently  $C_1$ - $C_3$  alkyl, and  $R_5$  is selected from hydrogen and halogen, and mixtures of said diamines.

- 5      83. The method of claim 81 wherein the diamine of general formula (B) is selected from one or more of the group consisting of:

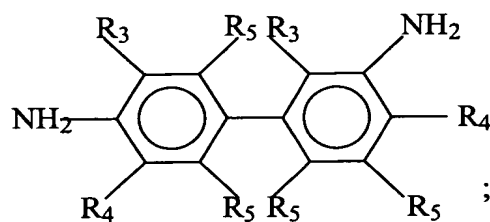
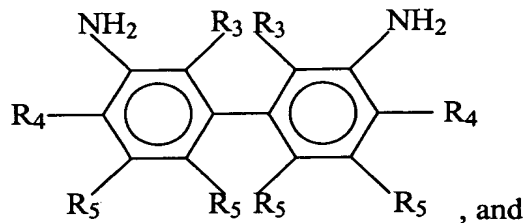
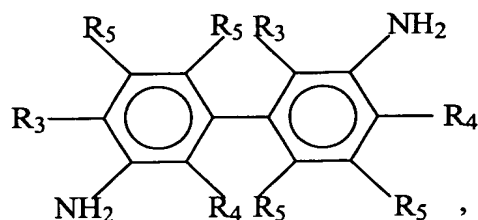
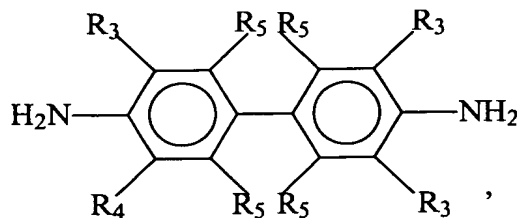




wherein  $R_3$  and  $R_4$  are each independently  $C_1$ - $C_3$  alkyl, and  $R_5$  is selected from hydrogen and halogen, and mixtures of said diamines.



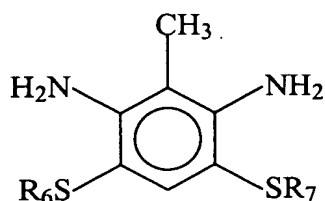
84. The method of claim 81 wherein the diamine of general formula (C) is selected from one or more of the group consisting of:



wherein R<sub>3</sub> and R<sub>4</sub> are each independently C<sub>1</sub>-C<sub>3</sub> alkyl, and R<sub>5</sub> is selected from hydrogen and halogen, and mixtures of said diamines.

85. The polymerizate of claim 69 wherein said polyamine reactant of said second component is a diamino toluene dialkyl sulfide.

86. The polymerizate of claim 85 wherein said diamino toluene dialkyl sulfide is a 2,6-diaminotoluene-3,5-dialkyl sulfide of the general formula:



wherein R<sub>6</sub> and R<sub>7</sub> are linear, branched or cyclic C<sub>1</sub> to C<sub>20</sub> alkyl

87. The photochromic article of claim 69 wherein a catalyst is added to said  
5 two-component composition to promote the polymerization.

88. The photochromic article of claim 87 wherein said catalyst is selected  
from the group consisting of tertiary amines and organometallic compounds.

10 89. The photochromic article of claim 69 wherein the polymerization process  
further comprises the step of :  
mixing said first component and said second component.

90. The photochromic article of claim 69 wherein the polymerization process  
15 further comprises the step of :  
degassing the said first component.

91. The photochromic article of claim 69 wherein the polymerization process  
further comprises the step of :  
20 degassing the said second component.

92. The photochromic article of claim 69 wherein the polymerization process  
further comprises the step of :  
adding a mixture of said first component and said second component to a  
25 mold.

93. The photochromic article of claim 92 wherein the polymerization process  
further comprises the step of :

heating the mold and said mixture within it.

94. The photochromic article of claim 93 wherein said heating step further includes heating the mold and said mixture to a temperature of from 100°C to 140°C  
5 over a period of from 0.5 to 16 hours.

95. The photochromic article of claim 69 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH<sub>2</sub> + -NH-) groups of from 0.5  
10 to 10.

96. The photochromic article of claim 69 wherein said first component and said second component are polymerized together in amounts sufficient to provide a molar equivalent ratio of (NCO + NCS) groups to (-NH<sub>2</sub> + -NH-) groups of from 0.5  
15 to 5.

97. The photochromic article of claim 69 further comprising additives selected from the group consisting of light stabilizers, heat stabilizers, antioxidants, ultraviolet light absorbers, mold release agents, static (non-photochromic) dyes, pigments and flexibilizing additives and anti-yellowing additives; and mixtures of  
20 said additives.

98. The photochromic article of claim 97 wherein the additives are present in said polymerizate in an amount up to 10% by weight of said polymerizate.  
25

99. The photochromic substance of claim 97 wherein the mold release agent is a C<sub>8</sub> to C<sub>16</sub> alkyl phosphate ester.

100. The photochromic article of claim 69 further comprising a photochromic  
30 substance.

101. The photochromic article of claim 100 wherein the photochromic substance is mixed with said first component.

102. The photochromic article of claim 100 wherein the photochromic  
5 substance is mixed with said second component.

103. The photochromic article of claim 100 wherein the photochromic substance is applied to said photochromic article at from 0.15 to 0.35 milligrams per square centimeter of surface area of said photochromic article.

10

104. The photochromic article of claim 100 wherein said photochromic substance is selected from the group consisting of spiro(indoline)naphthoxazines, spiro(indoline)benzoxazines, chromenes, benzopyrans, naphthopyrans, organo-metal dithizonates, (arylozo)-thioformic arylhydrazidates, mercury dithizonates, fulgides,  
15 fulgimides, 3-furyl fulgides, 3-thienyl fulgides, 3-furyl fulgimides and 3-thienyl fulgimide; and mixtures of said photochromic substances.

105. The photochromic article of claim 100 wherein the photochromic substance has an activated absorption maximum within the visible range of from 590  
20 to 700 nanometers.

106. The photochromic article of claim 100 wherein the photochromic substance has an activated absorption maximum within the visible range of from 400  
25 to 500 nanometers.

107. The photochromic article of claim 100 wherein the photochromic substance has an activated absorption maximum within the visible range of from 500  
to 700 nanometers.

108. The photochromic article of claim 100 wherein the photochromic substance is applied or incorporated into said photochromic article using a method selected from the list consisting of cast curing, encapsulating within a matrix of an  
30

organic polymerizate and incorporating into the two-component composition prior to curing.

109. The photochromic article of claim 100 wherein the photochromic  
5 substance is applied by imbibing the photochromic article such that permeation of the photochromic substance into the polymerizate is achieved.

110. The photochromic article of claim 109 wherein the imbibing process includes solvent assisted transfer absorption.

10

111. The photochromic article of claim 109 wherein the imbibing process includes vapor phase transfer.

112. The photochromic article of claim 100 wherein the photochromic  
15 substance is applied as a coating to the surface of the photochromic article.

113. The photochromic article of claim 109 wherein the imbibing process includes the steps of:

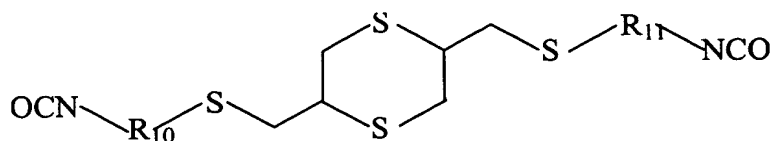
20 coating the photochromic article with the photochromic substance;  
heating the surface of the photochromic article; and  
removing the residual coating from the surface of the photochromic article.

114. The photochromic article of claim 100 wherein the photochromic article is an optical lens for correcting a visual defect.

25

115. The photochromic article of claim 69 wherein said polycyanate monomer has contains one or more sulfur atoms in its backbone.

116. The photochromic article of claim 115 wherein the polycyanate  
30 monomer containing one or more sulfur atoms in its backbone has the general structure:



wherein  $R_{10}$  and  $R_{11}$  are each independently  $C_1$  to  $C_3$  alkyl.

117. The method of claim 1 wherein the polymerization is carried out by  
5 reaction injection molding, wherein said first component and said second component  
are each metered from a cylinder through a mixing head and injected into a molding  
machine.

118. The polymerizate of claim 35 prepared by polymerizing said first  
10 component and said second component by reaction injection molding, wherein said  
first component and said second component are each metered from a cylinder through  
a mixing head and injected into a molding machine.

119. The photochromic article of claim 69 prepared by polymerizing said first  
15 component and said second component by reaction injection molding, wherein said  
first component and said second component are each metered from a cylinder through  
a mixing head and injected into a molding machine.